Supplementary Information

Charging dynamics of angstrom-scale pores of MXene electrode with ionic liquid electrolytes

Ming Chen[a)], Ostoja-Petkowski Sebastian [a)], Alexei A. Kornyshev [a)*]

[a)] *Department of Chemistry, Faculty of Natural Sciences, Imperial College, Molecular Sciences Research Hub, White City Campus, London, Wood Lane | W12 0BZ | UK*

*Correspondence to:

Alexei A. Kornyshev: a.kornyshev@imperial.ac.uk

Content

I. Charging dynamics in pores of different sizes

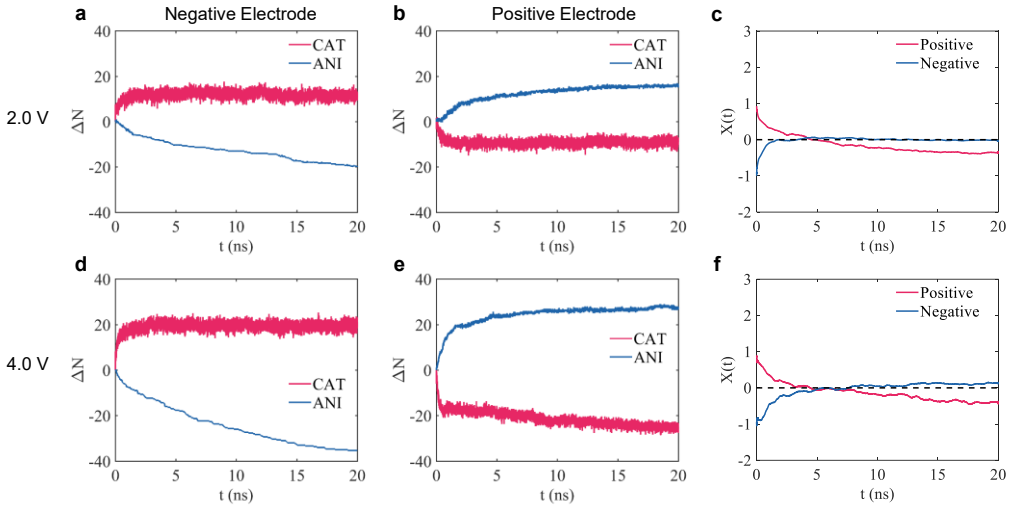

Figure S1. Charging mechanisms in 0.7 nm MXene pore. (a,b) Time evolution of the ion number difference, ΔN, in the negatively charged **(a)** and positively charged **(b)** pores under an applied cell voltage of 2 V. **(c)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 2 V. **(d,e)** Evolution of ΔN in the negatively charged **(d)** and positively charged **(e)** pores under an applied cell voltage of 4 V. **(f)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 4 V.

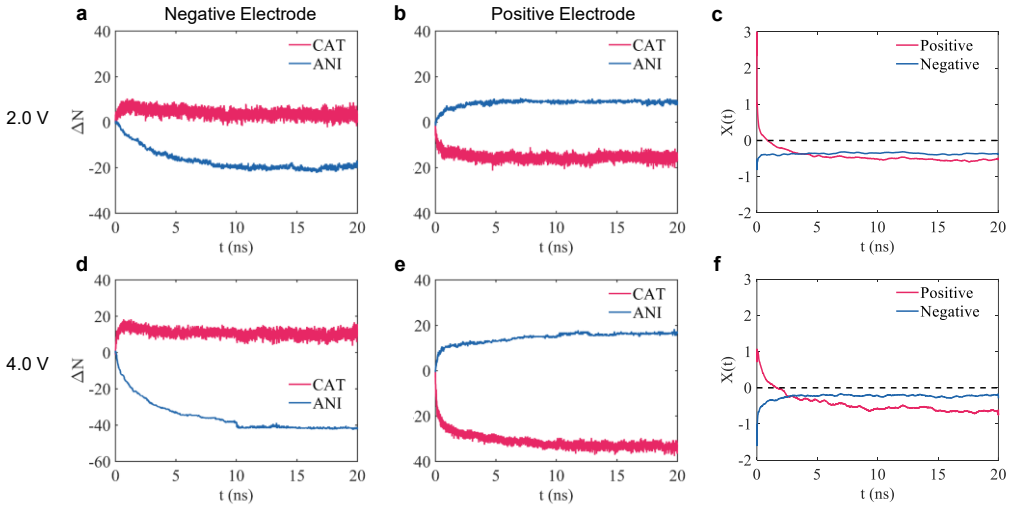

Figure S2. Charging mechanisms in 0.8 nm MXene pore. (a,b) Time evolution of the ion number difference, ΔN, in the negatively charged **(a)** and positively charged **(b)** pores under an applied cell voltage of 2 V. **(c)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 2 V. **(d,e)** Evolution of ΔN in the negatively charged **(d)** and positively charged **(e)** pores under an applied cell voltage of 4 V. **(f)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 4 V.

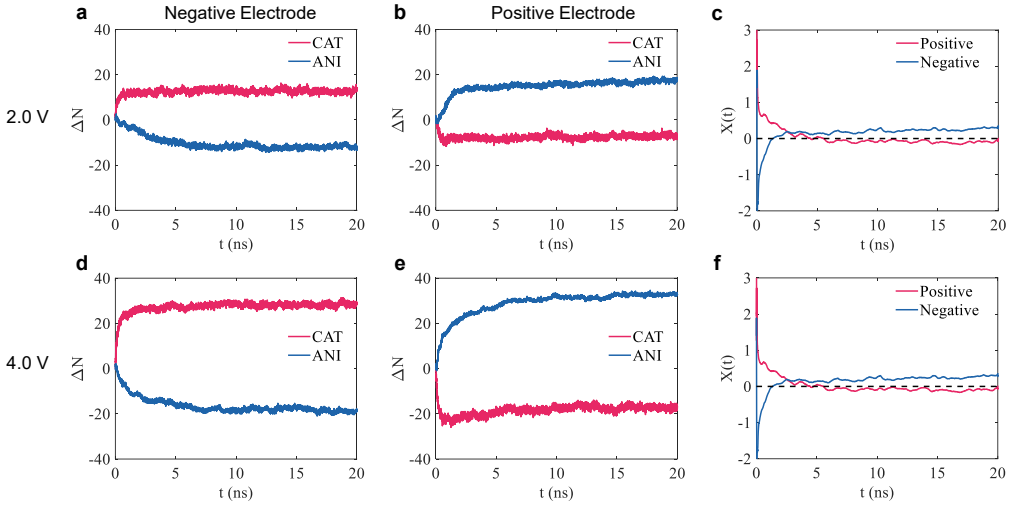

Figure S3. Charging mechanisms in 1.0 nm MXene pore. (a,b) Time evolution of the ion number difference, ΔN, in the negatively charged **(a)** and positively charged **(b)** pores under an applied cell voltage of 2 V. **(c)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 2 V. **(d,e)** Evolution of ΔN in the negatively charged **(d)** and positively charged **(e)** pores under an applied cell voltage of 4 V. **(f)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 4 V.

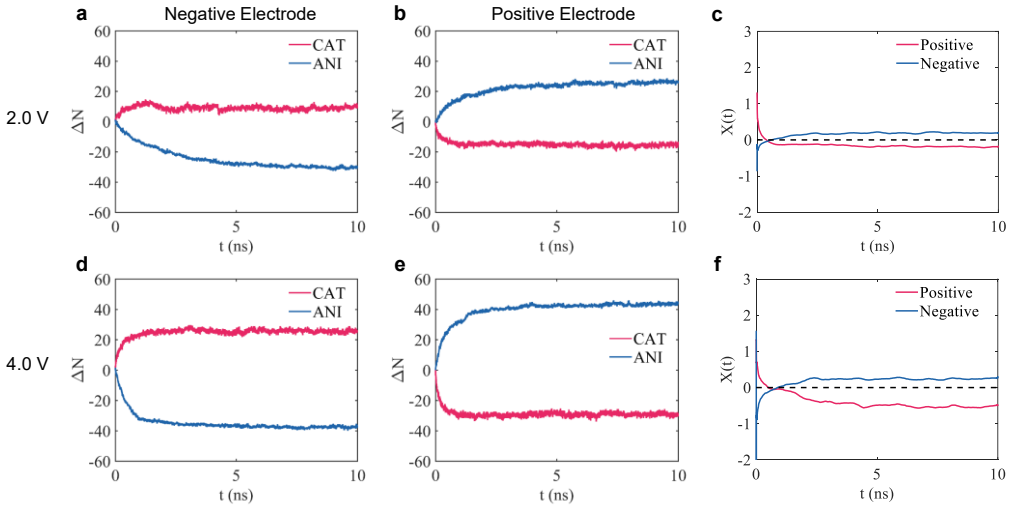

Figure S4. Charging mechanisms in 1.2 nm MXene pore. (a,b) Time evolution of the ion number difference, ΔN, in the negatively charged **(a)** and positively charged **(b)** pores under an applied cell voltage of 2 V. **(c)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 2 V. **(d,e)** Evolution of ΔN in the negatively charged **(d)** and positively charged **(e)** pores under an applied cell voltage of 4 V. **(f)** Time Evolution of the voltage-dependent charging parameter $X(t)$ under an applied cell voltage of 4 V.

II. Free-ion content in a sample pore

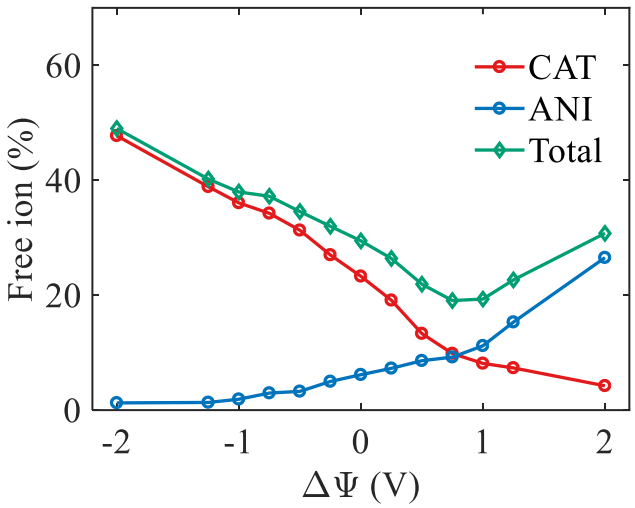

Figure S5. Voltage-dependent proportion of free cations and anions inside of a 1.0 nm-size MXene pore as a function of its polarisation.